# *Spotlights on Non-Dialytic Treatment of AKI*

**Mohammed Wahba**

*Lect. Of int. medicine and nephrology*

*Mansoura Faculty of Medicine*

# Agenda

Practice Essentials

Main target of therapy of AKI.

Lines of management

- Prevention.
- Non pharmacological lines.
- Pharmacological agents.
- Future lines of therapy.

# Practice Essentials

**Acute kidney injury (AKI) is defined as an abrupt or rapid decline in renal filtration function.**

## AKI is defined as any of the following :

Increase in SCr by ≥ 0.3 mg/dl within 48 hours; or

Increase in SCr to ≥ 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days; or

Urine volume < 0.5 ml/kg/h for 6 hours.

## Essential update:

FDA approves first test to predict AKI in critically ill patients (NephroCheck) The test identifies the presence of two AKI-associated proteins (insulinlike growth-factor binding protein 7, tissue inhibitor of metalloproteinases). Based on the level of these proteins, a score is derived that indicates the likelihood that a patient will develop AKI within the next 12 hours. the test reported false positives in about 50% of patients without AKI.

# Practice Essentials

## Categories of AKI

AKI may be classified into 3 general categories, as follows:

- **Pre renal** - As an adaptive response to severe volume depletion and hypotension, with structurally intact nephrons.
- **Intrinsic** - In response to cytotoxic, ischemic, or inflammatory insults to the kidney, with structural and functional damage.
- **Post renal** - From obstruction to the passage of urine.

# Practice Essentials

## Oliguric and non oliguric patients with AKI

Classifying AKI as oliguric or non oliguric on the basis of daily urine excretion has prognostic value. Oliguria is defined as a daily urine volume of less than 400 mL and has a worse prognosis, except in pre renal injury.

Anuria is defined as a urine output of less than 100 mL/day and, if abrupt in onset, suggests bilateral obstruction or catastrophic injury to both kidneys.

Stratification of renal injury along these lines helps in diagnosis and decision-making (eg, timing of dialysis) and can be an important criterion for patient response to therapy.

# Practice Essentials

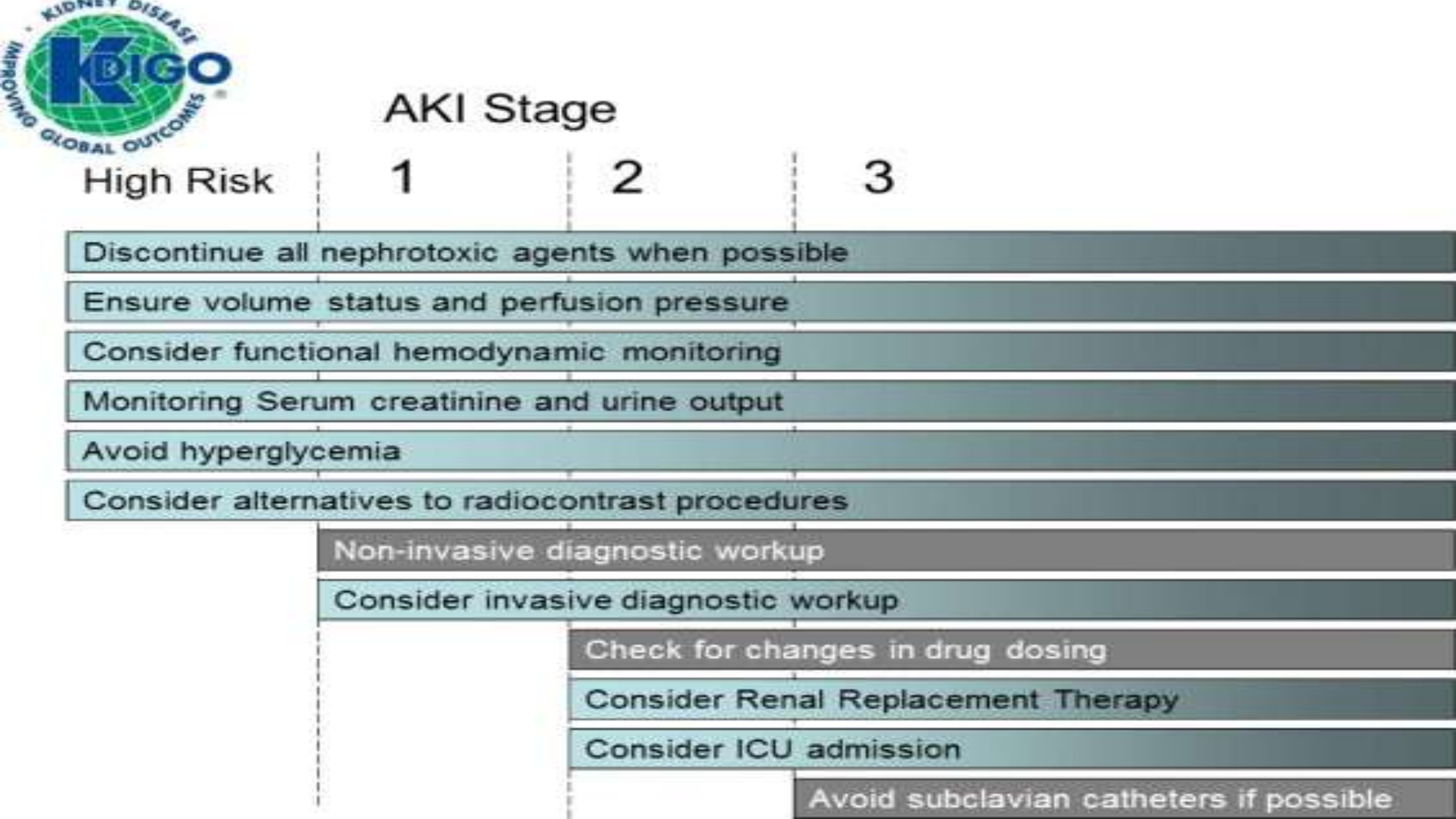
- **Other systems of classifications**

**RIFLE** **AKIN** **KIDOGO**

| Stage | Serum creatinine | Urine output |
|---|---|---|
| 1 | 1.5–1.9 times baseline<br>OR<br>≥0.3 mg/dl increase | <0.5 ml/kg/h for 6–12 hours |
| 2 | 2.0–2.9 times baseline | <0.5 ml/kg/h for ≥12 hours |
| 3 | 3.0 times baseline<br>OR<br>Increase in serum creatinine to ≥4.0 mg/dl OR<br>Initiation of renal replacement therapy<br>OR, In patients <18 years, decrease in eGFR to <35 ml/min per 1.73 m2 | <0.3 ml/kg/h for ≥24 hours<br>OR<br>Anuria for ≥12 hours |

# Practice Essentials

- The cause of AKI should be determined whenever possible.
- Patients be stratified for risk of AKI according to their susceptibilities and exposures.
- Manage patients according to their susceptibilities and exposures to reduce the risk of AKI.
- Test patients at increased risk for AKI with measurements of SCr and urine output to detect AKI.
- Individualize frequency and duration of monitoring based on patient risk and clinical course.
- Evaluate patients with AKI promptly to determine the cause, with special attention to reversible causes.
- Monitor patients with AKI with measurements of SCr and urine output to stage the severity.
- Manage patients with AKI according to the stage and cause.
- Evaluate patients 3 months after AKI for resolution, new onset, or worsening of pre-existing CKD.
    - If patients have CKD, manage these patients as detailed in the KDOQI CKD Guideline
    - If patients do not have CKD, consider them to be at increased risk for CKD and care for them as detailed in the KDOQI CKD Guideline 3 for patients at increased risk for CKD.


KIDNEY DISEASE
KDIGO
IMPROVING GLOBAL OUTCOMES
AKI Stage
High Risk
1
2
3
Discontinue all nephrotoxic agents when possible
Ensure volume status and perfusion pressure
Consider functional hemodynamic monitoring
Monitoring Serum creatinine and urine output
Avoid hyperglycemia
Consider alternatives to radiocontrast procedures
Non-invasive diagnostic workup
Consider invasive diagnostic workup
Check for changes in drug dosing
Consider Renal Replacement Therapy
Consider ICU admission
Avoid subclavian catheters if possible

# *Main target of therapy of AKI.*

- **Approach Considerations**
  - Measures to correct underlying causes of (AKI) should begin at the earliest indication of renal dysfunction. Serum creatinine does not rise to abnormal levels until a large proportion of the renal mass is damaged, because the relationship between (GFR) and the serum creatinine level is not linear, especially early in disease. Indeed, the rise of serum creatinine may not be evident before 50% of the GFR is lost.
  - It cannot be overstated that the current treatment for AKI is mainly supportive in nature; no therapeutic modalities to date have shown efficacy in treating the condition. Therapeutic agents (eg, dopamine, fenoldopam, mannitol) are not indicated in the management of AKI and may be harmful for the patient.

# *Main target of therapy of AKI.*

- **Maintenance of volume homeostasis and correction of biochemical abnormalities remain the primary goals of treatment and may include the following measures:**

**Correction of fluid overload with furosemide**

**Correction of severe acidosis with bicarbonate administration, which can be important as a bridge to dialysis**

**Correction of hyperkalemia**

**Correction of hematologic abnormalities (eg, anemia, uremic platelet dysfunction) with measures such as transfusions and administration of desmopressin or estrogens**

# Lines of management

- **Prevention:**

  **Who are at risk?**

  **age > 65ys**

  **underlying renal or urological disease.**

  **presence of co-morbidities esp. DM, HTN, advanced liver or cardiac disease.**

  **hypovolemia.**

  **specific risks factors related to contrast.**

  **specific risk factors related to nephrotoxic drugs.**

  **anemia.**

  **sepsis.**

# *Lines of management*

- **Non pharmacological lines**
  - **Fluids**
  - **Nutrition and glycemic control.**

# *Lines of management*

## Hemodynamic monitoring and support for prevention and management of AKI:

In the absence of hemorrhagic shock, suggesting using isotonic crystalloids rather than colloids (albumin or starches) as initial management for expansion of intravascular volume in patients at risk for AKI or with AKI.

Type of fluids?

- Crystalloids vs colloids?
- Colloid specific effects.
- Crystalloid choice.

and fluid balance status.

For how long fluid support is needed?

# *Lines of management*

- **Nutrition and glycemic control.**
  - **Glycemic control**
    - **Caloric requirements.**
    - **Target.**
    - **Method of control.**
    - **Effect**
    - **Common reflects.**

# *Lines of management*

- **Nutritional status:**
  - **Protein requirements.**
  - **Type.**
  - **Recommendations.**
  - **Trace elements and vitamins.**
  - **Fatty acids.**
  - **Specific considerations about a.a.**

# Lines of management

- **Pharmacological agents**
  - **VASOPRESSORS :**

    **The use of vasopressors in conjunction with fluids in patients with vasomotor shock with, or at risk for, AKI.**

    **Vasopressin vs dopamine vs norepinephrine.**

    **Using protocol-based management of hemodynamic and oxygenation parameters to prevent development or worsening of AKI in high-risk patients in the perioperative setting or in patients with septic shock.**

**The physiologic goals are:**

**i) return of mean arterial blood pressure to >65mm Hg;**

**ii) central venous pressure between 8–12mm Hg;**

**iii) improvement in blood lactate levels;**

**iv) central venous oxygen saturation (ScvO2)>70%; and**

**v) a urine output of >0.5 ml/kg/h.**

# *Lines of management*

- **Diuretics:**

  Not using diuretics to prevent AKI.

  Not using diuretics to treat AKI, except in the management of volume overload.

  Theoretical background about Reno protective effect of loop diuretic (furosemide).

  What against?

  Specific expected benefits.

  Mannitol.

# *Lines of management*

**Vasodilator therapy: dopamine, fenoldopam, and natriuretic peptides**

Not recommended in either treatment or prevention of AKI.

**Growth factor intervention**

Not using recombinant human (rh)IGF-1 to prevent or treat AKI. Also no significant difference after use of ESA.

**Adenosine receptor antagonists (theophylline and rolophylline)**

a single dose of theophylline may be given in neonates with severe perinatal asphyxia, who are at high risk of AKI.

# *Lines of management*

## ON-PUMP VS. OFF-PUMP CORONARY ARTERY BYPASS SURGERY

## N-ACETYLCYSTEINE (NAC)

- Role.
- Dose.
- Uses.
- Combination with saline and sodium bicarbonate.
- What about statins?

**Treatment of complications as acidosis, hyperkalemia and other electrolytes.**

# *Lines of management*

- **Future lines of treatment:**
  - **Principles.**
  - **Examples: anti TNF alpha, biological agents against specific biomarkers as nephrines.**

# *Conclusions:*

- **Management of AKI is mainly targeted to prevent the process of AKI.**
- **Monitoring is so important.**
- **Supportive treatment is targeted mainly to prevent and/or treatment of complications and to avoid progression into CKD.**
- **Future treatment is targeted to $G_1$ phase of cycle of cell death.**


Thanks